

## SECTION 4 | DEVELOPMENT

72. This section describes potential impacts of lynx conservation efforts on the value of future residential, commercial, and industrial development in the study area. Development may affect the species or its habitat by restricting movement via habitat fragmentation, or direct habitat loss.<sup>49</sup> Owners of parcels containing a federally-listed species, or designated as critical habitat for a listed species, may face certain land use restrictions that preclude, restrict, delay, or increase the cost of development on some or all of the parcel. Such outcomes may reduce the value of the property.
73. Existing development, such as "towns, or human-made structures such as buildings, airports, paved and gravel roadbeds, active railroad beds, and other structures that lack the [primary constituent elements] PCEs for the lynx" are not included in the study area.<sup>50</sup> Activities such as reconstruction or maintenance of existing developments are therefore not expected to affect the lynx or the PCEs on which it depends, and are therefore not expected to be impacted by lynx conservation.
74. The extent to which a future development project may be impacted by lynx conservation efforts is difficult to estimate. In particular, information is not available regarding how development activity has been affected by lynx conservation in the past, and specific guidelines or standards have not been described to provide developers with information regarding how their activities may incorporate lynx conservation for future projects. For example:
- No consultations have taken place on residential development in consideration of the lynx. Only a handful of consultations associated with commercial developments have occurred. None of these consultations resulted in project modifications; all were determined not to affect the lynx.
  - The Lynx Conservation Assessment Strategy (LCAS) does not specify conservation guidelines related to commercial and residential developments. Regarding land ownership, the LCAS specifies as a general goal, "(w)ork toward unified management direction via habitat conservation plans, conservation easements, or agreements, and land acquisition."

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<sup>49</sup> Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2<sup>nd</sup> Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003), pg. 50.

<sup>50</sup> 70 FR 68304-5

- No other information is available regarding if or how private parties have modified their behavior regarding development in the past for the benefit of the lynx.
75. The development analysis in this final economic analysis quantifies the potential economic impacts to development activities if timber-related lynx conservation standards from the LCAS were to be implemented to development projects across the study area. Specifically, it quantifies the impact of allowing no more than 15 percent of a watershed to be developed within the study area, as described in detail in Section 4.2. Discussion with the Service indicates that timber-related lynx habitat conservation thresholds may be useful to consider the potential impacts to development activities.<sup>51</sup>
76. As the study area in Unit 4 in Washington is characterized by public lands managed for timber and recreation, development is not considered a likely future land use and the value of these lands for future development is considered negligible.

#### 4.1 SUMMARY OF RESULTS

77. Post designation impacts to development are presented by subunit in Exhibit 4-1.

##### Areas proposed for designation

78. Lost option value for future new development in lynx habitat is forecast to be \$706 million to \$770 million.

##### Areas proposed for exclusion

79. There is no lost option value for future new development for lands considered for exclusion, which are primarily Tribal lands and public lands.

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<sup>51</sup> Personal communication with U.S. Fish and Wildlife Service, August 30, 2006.

## EXHIBIT 4-1. ESTIMATED DEVELOPMENT IMPACTS BY SUBUNIT

SUBUNIT	ESTIMATED FOREGONE DEVELOPMENT (ACRES)	TOTAL VALUE OF FOREGONE DEVELOPMENT  (2006\$)		ANNUALIZED VALUE OF FOREGONE DEVELOPMENT  (7% DISCOUNT RATE)	
		LOW	HIGH	LOW	HIGH
UNIT 1: MAINE					
Private Timber Lands	112	\$2,530,000	\$2,530,000	\$177,000	\$177,000
SUBTOTAL UNIT 1	112	\$2,530,000	\$2,530,000	\$177,000	\$177,000
Average per acre value of future foregone development in Unit 1		\$22,600	\$22,600	\$1,580	\$1,580
UNIT 2: MINNESOTA					
Private Mining Lands	6,676	\$11,900,000	\$13,900,000	\$830,000	\$973,000
Private Timber Lands	8,726	\$17,400,000	\$17,600,000	\$1,220,000	\$1,230,000
Unknown Landowner	211,422	\$629,000,000	\$678,000,000	\$44,000,000	\$47,500,000
SUBTOTAL UNIT 2	226,825	\$658,000,000	\$709,000,000	\$46,100,000	\$49,700,000
Average per acre value of future foregone development in Unit 2		\$2,900	\$3,130	\$203	\$219
UNIT 3: NORTHERN ROCKY MOUNTAINS					
U.S. Fish and Wildlife Service	1,623	\$264,000	\$265,000	\$18,500	\$18,500
Montana Dept. of Natural Resources	300	\$82,700	\$105,000	\$5,790	\$7,350
Montana Fish, Wildlife, and Parks	34	\$3,590	\$3,590	\$251	\$251
Montana University System	29	\$1,190	\$1,190	\$83	\$83
Private Timber Lands	9,419	\$3,372,000	\$7,910,000	\$236,000	\$554,000
Conservation NGO	3,031	\$118,000	\$625,000	\$8,280	\$43,700
Unknown landowner	172,930	\$41,800,000	\$48,600,000	\$2,930,000	\$3,400,000
U.S Bureau of Land Management	14	\$1,240	\$2,800	\$87	\$196
SUBTOTAL UNIT 3	187,426	\$45,700,000	\$57,600,000	\$3,200,000	\$4,030,000
Average per acre value of future foregone development in Unit 3		\$244	\$307	\$17	\$21
Note: Totals may not sum due to rounding.					

## 4.2 METHODS AND ASSUMPTIONS

80. In order to provide information regarding potential impacts of lynx conservation efforts on development activities, this analysis identifies areas that may exceed timber-related thresholds for habitat disturbance specified in the LCAS.

### 4.2.1 ASSUMPTIONS AND CAVEATS

81. Analyzing the impacts of lynx conservation on development involves several important assumptions and caveats; these are summarized below and detailed in the remainder of this section.

- The primary assumption applied in the analysis is that lynx conservation standards from the LCAS will be implemented across the study area. The LCAS does not, however, outline lynx conservation standards related specifically to development activities. Following discussion with the Service, this analysis assumes that timber-related lynx habitat conservation thresholds are applicable to development activities.<sup>52</sup>
- Because lynx conservation planning is conducted at the level of a lynx home range or LAU according to the LCAS, this analysis assumes sub-watersheds (12-digit hydrologic unit codes (HUC) in Maine and Montana and 11-digit HUCs in Minnesota) approximate an LAU in the study area.<sup>53</sup>
- There are several caveats associated with using watersheds to approximate LAUs. First, these watersheds vary greatly in size. Second, at the 12-digit HUC level in Maine, watersheds may be fragmented (not contiguous).<sup>54</sup> Third, watershed boundaries do not correspond with the critical habitat boundaries and so fractions of watersheds are therefore considered LAUs in cases where the critical habitat boundary bisects a watershed. Finally, the analysis assumes that surface waters should not be considered part of an LAU, and removes these surface water acreages to avoid distorting the percentages of watersheds that may be developed.
- Development is considered in this analysis separate from other activities occurring within the watershed, and thus separate in terms of how those activities may additionally contribute to the habitat disturbance threshold. That is, this analysis considers only how development may constitute conversion of lynx habitat to an unsuitable condition; other activities occurring within the watershed, such as timber management and recreation

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<sup>52</sup> Assuming these conservation thresholds are applicable to development may underestimate or overestimate the impacts of lynx conservation on development activities depending on whether habitat conservation thresholds related to development activities would be greater or less than those related to timber activities, which are applied in this analysis.

<sup>53</sup> The 12-digit HUC level watershed has not yet been mapped for Minnesota. For Minnesota, this analysis applies the 11-digit HUC, which is the most refined level of watershed data available.

<sup>54</sup> Six watersheds in this analysis are fragmented, all in Maine.

are not considered in determining whether habitat conservation thresholds are exceeded.<sup>55</sup>

- This analysis forecasts development potential of the critical habitat area based on current zoning. It therefore does not account for possible re-zoning within the region to accommodate greater levels of development.
- This analysis assumes that the entirety of a "developable" parcel constitutes a habitat disturbance and thus counts the full acreage of developable parcels toward the habitat conservation threshold. This assumption is sensitive to the Service's interpretation of the footprint of a development in the context of habitat conservation, whether only the developed portion or the entire acreage of a parcel would be considered habitat.<sup>56</sup>
- This analysis defines "developable" land as currently undeveloped lands that are amenable to future development as determined by available zoning or land use planning information. Impacts to development activities in this analysis are the lost option value for future new development in lynx habitat. Because existing development is already a disturbance to lynx habitat, redevelopment of already developed areas is not expected to experience impacts related to lynx habitat conservation.

#### 4.2.2 DETAILED METHODOLOGY

82. The development analysis is based on the following timber-related lynx conservation thresholds specified in the LCAS:

- Management actions (e.g., timber sales, salvage sales) shall not change more than 15 percent of lynx habitat within a lynx analysis unit (LAU) to an unsuitable condition within a 10-year period.
- If more than 30 percent of lynx habitat within an LAU is in unsuitable condition, no further reduction of suitable conditions shall occur.<sup>57</sup>

83. Absent more specific information on how development activities may be modified for the benefit of the lynx, the analysis applies these timber-related habitat conservation thresholds to development activity in the study area in the following manner:

1. **Develop a proxy for LAUs in the study area.** LAUs have been delineated on Federal lands in the west that have adopted the LCAS in land use planning and management. LAUs are not, however, delineated within the areas

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<sup>55</sup> This assumption may lead to an underestimate of impacts to development if other activities taking place in a watershed decrease the amount of suitable habitat for the lynx. The extent to which development impacts may be underestimated as a result of this assumption, however, is unknown. Further, other sections of this analysis quantify impacts to other land use activities within the study area of modifying the activities for the benefit of the lynx, and therefore may already capture some degree of compliance with these timber-related habitat conservation thresholds.

<sup>56</sup> This assumption may overestimate impacts of lynx conservation on development depending on the Service's interpretation of the footprint of a development.

<sup>57</sup> Ruediger, B., et. al. 2000.

considered developable in the study area. LAUs are drawn so that lynx conservation planning may be undertaken at the scale of a typical lynx home range; existing LAUs have used watersheds to approximate the home range. This analysis therefore uses watersheds as a proxy for LAUs in the study area. As the typical lynx home range is on a scale of 20 to 30 square miles (12,800 to 19,200 acres) and may be up to 100 square miles, this analysis uses the watersheds at the closest possible geographic scale to this size.<sup>58</sup> The LAU proxy watersheds in this analysis remove the surface water acreage as it is assumed that the water bodies themselves are not part of the lynx home range. The dry land acres of the watersheds therefore constitute the approximation of LAUs in this analysis. Due to the underlying hydrology of the region, the watersheds vary in size as detailed in Appendix G.

2. **Determine the extent of existing development within the watersheds.** Existing development was identified using a combination of land use and ownership, and zoning and appraisal data. For Unit 2, Minnesota, limited information was available to identify already developed lands. Satellite imagery was therefore consulted to identify developed areas. This analysis accordingly assumes that lands bordering Duluth and Lake Superior are "developed."
3. **Approximate the level of potential future development within the watersheds.** Applying the same data sources identified in step 2, future development is forecast across the critical habitat area assuming that undeveloped privately-owned parcels zoned for development, or for which land uses are unknown, may be developed in the future. Due to the dearth of data regarding the distribution of existing development in Unit 2, Minnesota, as mentioned above, this analysis assumes that the proposed habitat on private and unknown lands is not currently developed and therefore "developable" in all areas with the exception of the developed areas surrounding Lake Superior and Duluth.
4. **Identify watersheds for which existing and future development activities may surpass the thresholds for habitat disturbance.** Impacts to development are assumed to occur only in watersheds where existing plus potential future development activities may surpass the habitat conservation thresholds defined above. Because development is assumed to be a permanent disturbance to habitat, and because the temporal distribution of the expected potential future development is uncertain, this analysis focuses on

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<sup>58</sup> 12-Digit Hydrological Unit Codes for Maine, "WBDME6\_A" [Shapefile], 2004, Augusta ME: Maine Office of Geographic Information Systems (MEGIS), accessed at <http://megis.maine.gov/catalog/> on September 5, 2006; 11-Digit Hydrological Unit Codes for Minnesota, "NRCWS99" [Shapefile], 1999, St. Paul, Minnesota: Minnesota Land Management Information Center (LMIC), accessed at [ftp://ftp.lmic.state.mn.us/pub/data/phys\\_biol/water/nrcws99.exe](ftp://ftp.lmic.state.mn.us/pub/data/phys_biol/water/nrcws99.exe) on December 20, 2005; Draft 6th Code Hydrologic Units [Shapefile], 2006, Bozeman, Montana: Natural Resources Conservation Service, accessed at <http://nris.state.mt.us/nsdi/watershed/datapage.html> on September 4, 2006.

the 15 percent habitat conservation threshold described in the LCAS. Accordingly, if existing development constitutes 15 percent of the watershed area, no further development is assumed to occur and the value of any predicted future development is lost. Alternatively, if less than 15 percent of a watershed is already developed, this analysis assumes development may occur in the areas identified as developable, up to a maximum total developed acreage of 15 percent of the watershed.<sup>59</sup> For watersheds for which no development is forecast, no losses are quantified.

5. **Quantify lost option values for development.** Appraisal and land sales transactions data were consulted to determine the development. To estimate potential losses in watersheds for which only a portion of forecast development is expected to be precluded, this analysis assumes at the low end that the land would be developed by parcel from highest option value for development to lowest option value for development; at the high end, this analysis assumes the parcels would be developed from lowest to highest option value for development.

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<sup>59</sup> This analysis defines "developable" land as currently undeveloped lands that are amenable to future development as determined by available zoning or land use planning information.

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### Estimating Development Value

The conceptual framework for estimating the full development value for a parcel of land is based on the theoretical models developed by Capozza and Li (1994) and Capozza and Helsley (1990).<sup>a</sup> Capozza and Helsley's study demonstrates that the price of agricultural land has three components: the value of agricultural rents, the growth premium, and the option value of potential development. This analysis applies this logic to the forested lands within the study area by assuming that the price of land in the study area is comprised similarly of:

- The value of silvicultural rents - This represents the value of land as a silvicultural input and generally reflects the commercial present value of the trees.
- The growth premium - This equals the present value of expected increases in land rents after being converted to development.
- The option value of potential development - This is the value of land derived from the option of future development.

It follows that if development of a parcel of silvicultural land is restricted, it will be worth less than its value in the previously unrestricted state. This reduction in value is a cost to the landowner, with the magnitude of reduction depending on the type of land use restriction imposed. If future development is precluded from a parcel, the reduction in land value equals the sum of growth premium and option value. In some cases, land use information indicates that silviculture is not a possible land use. This may be true, for example, where the tree species mix has negligible commercial value. In such cases, this analysis assumes that the only potential future use of the parcel is for development, and therefore that the full price of the land reflects only its development option and growth premium.

<sup>a</sup> Capozza, D.R. and Yuming Li. "The Intensity and Timing of Investment: The Case of Land." *The American Economic Review*, Vol.84, No. 4 (Sep., 1994):889:904. Capozza, D. R. and R.W. Helsley. "The Stochastic City," *Journal of Urban Economics* 28(1990):187-203.

#### 4.3 UNIT BY UNIT ANALYSIS

84. This analysis employs the best available data in each geographic region of the study area to quantify the potential economic impacts to development activities. The remainder of this section describes the data sources and analytic process for the analysis by unit, as the information available varies by unit. Detailed results by watershed are included in Appendix G.

##### 4.3.1 UNIT 1: MAINE

##### Identification of Where Development Impacts May Occur

85. For Maine, 12-digit HUCs were used as a proxy for LAU boundaries for the purposes of this analysis.<sup>60</sup> A total of 347 watersheds intersect the study area in Maine. Existing

<sup>60</sup> 12-Digit Hydrological Unit Codes for Maine, "WBDME6\_A" [Shapefile], 2004, Augusta ME: Maine Office of Geographic Information Systems (MEGIS), accessed at <http://megis.maine.gov/catalog/> on September 5, 2006.



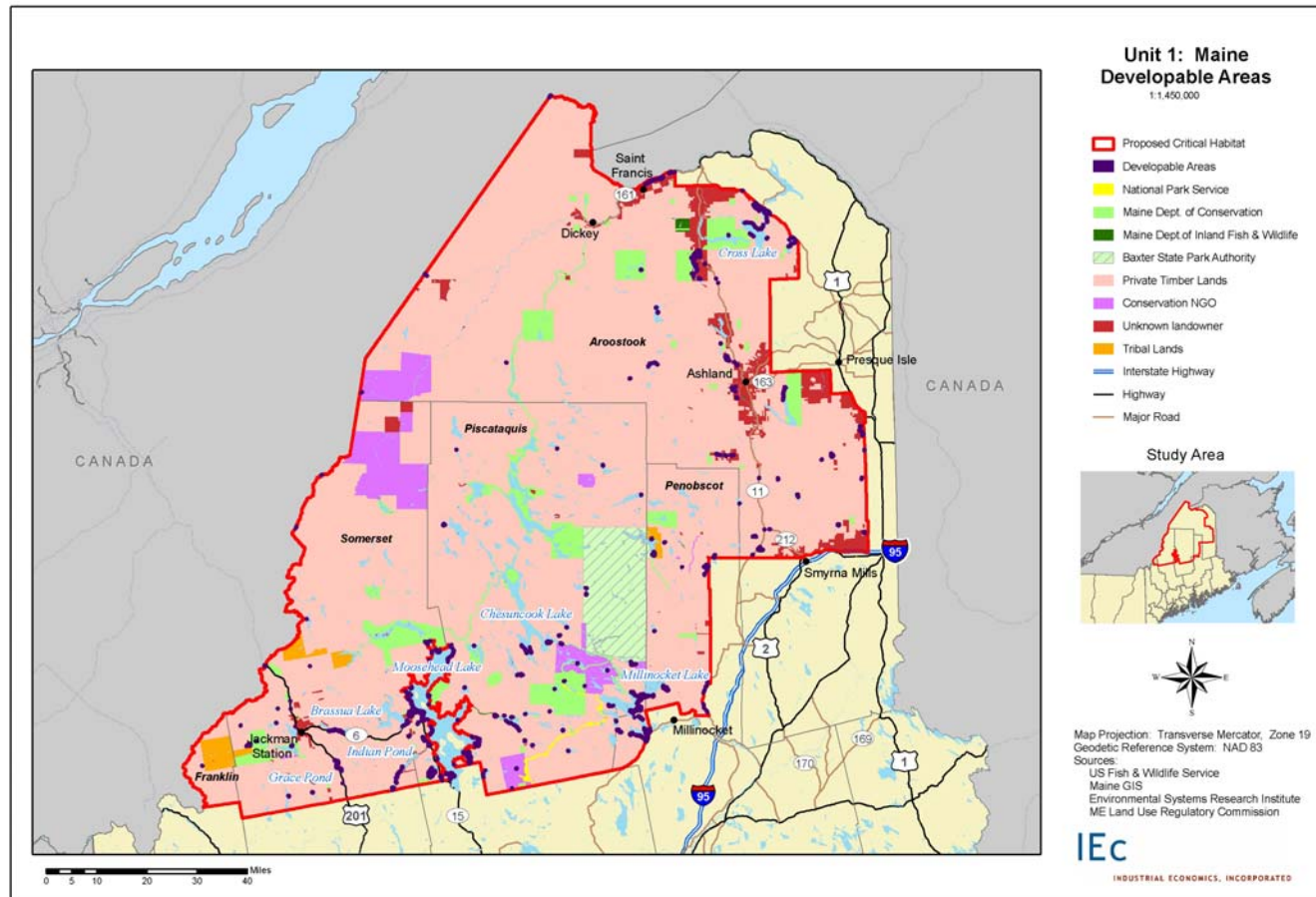
development and developable areas within each watershed were identified using GIS data provided by Maine's Land Use Regulatory Commission (LURC) that characterized land use zoning across the region.<sup>61</sup> The entirety of the study area in Maine is within LURC's jurisdiction. All developments occurring within LURC's jurisdiction must be permitted by LURC.

86. These data identified land parcels zoned for development for which there is no value of existing buildings or infrastructure; these parcels are considered developable in this analysis.<sup>62</sup> Exhibit 4-2 maps these developable parcels across the subunits in Maine. Developable parcels are small and scattered across the region. Some parcels within public lands are zoned for development; these may be private inholdings or they may be expected to experience development associated with public land uses (e.g., for buildings or infrastructure to support recreation). A total of 5,638 acres are characterized as developable in Unit 1 according to the LURC data.
87. Applying the methodology described above, development is expected to exceed the 15 percent habitat conservation threshold in two watersheds. Existing development exceeds the 15 percent threshold in one watershed (Moose Bay), while existing plus forecast development exceeds the threshold in another watershed (St. Francis River).

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<sup>61</sup> LURC GIS data was received on April 19, 2006 from Ellen Jackson, LURC GIS Coordinator. The data consisted of a LURC zoning layer ("lurczones.shp") and a LURC-defined parcel layer for all counties within the study area. This method of identifying developable acres was approved by the Maine Revenue Service (MRS), which conducts the land value appraisals for LURC in Maine.

<sup>62</sup> This assumption was considered to be reasonable according to LURC and the Maine Revenue Service.

EXHIBIT 4-2. DISTRIBUTION OF DEVELOPABLE ACRES IN UNIT 1: MAINE<sup>63</sup>

<sup>63</sup> GIS Source Data: Maine Landownership (Primary Landowners). December, 2005. Old Town, Maine. J.W. Sewall Company. Data received 12/18/2005; LURC Zoning Layer, April, 2006. Augusta, Maine. Maine Department of Conservation, Land Use and Regulatory Commission. Data received 4/19/2006; Maine Revenue Service's Appraisal Data. April, 2006. Augusta, Maine. Maine Revenue Service, data received 4/19/2006; Proposed Critical Habitat for Canada Lynx, "mech\_prop" [Shapefile]. U.S. Fish and Wildlife Service, received November 16, 2005.

#### Determining Development Values

88. Development values in Maine were determined for two types of parcels: waterfront and inland. This analysis considers areas zoned for development within a 250-foot buffer of a major lake as "waterfront", and all others as "inland."<sup>64</sup>
89. For waterfront land values, the Maine Revenue Service (MRS) is in the process of appraising land across the unincorporated portion of Maine.<sup>65</sup> Based on the front-foot length and corresponding parcel acreage, this analysis derives a per-acre value of developable waterfront land. The resulting per-acre waterfront values are lake-specific and, for larger lakes, variances exist in waterfront property value at different locations along the lakefront (e.g., Moosehead and Millinocket Lake). These variances in land value are driven by the existence of amenities such as road access and proximity to developed areas.<sup>66</sup> Exhibit 4-3 describes the values per acre of lakefront parcels by lake.

**EXHIBIT 4-3. VALUES PER ACRE OF WATERFRONT PARCELS IN MAINE BY LAKE**

LAKE	VALUE PER ACRE OF WATERFRONT
Attean Pond	\$104,000
Brassua Lake	\$70,000
Chesuncook Lake	\$109,000
Cross Lake	\$73,000
Grace Pond	\$21,300
Indian Pond	\$349,000
Long Pond	\$80,500
Millinocket Lake	\$19,800 - \$25,000
Moose River	\$229,000
Moosehead Lake	\$121,000 - \$212,000
"Other Small Ponds"	\$21,300
Source: Written communication with Bob Doirion, Supervisor of Unorganized Territories at the Maine Revenue Service, April 26, 2006.	

<sup>64</sup> MRS provided "front-foot values" (the value of a foot of shore frontage) for all lakes near parcels zoned for development in the study area. Front-foot values are measured within 250 ft. from the shoreline. Therefore, the analysis considers all land within 250 ft. "waterfront" and all lands beyond 250 ft. "inland." Personal communications with Bob Doirion, Maine Revenue Service, April 24, 2006.

<sup>65</sup> Written communication with Bob Doirion, Supervisor of Unorganized Territories at the Maine Revenue Service, on April 26, 2006. Communication included front-foot values for the following water bodies: Attean Pond, Brassua Lake, Chesuncook Lake, Cross Lake, Grace Pond, Indian Pond, Long Pond, Millinocket Lake, Moose River, and Moosehead Lake.

<sup>66</sup> Personal communication with Bob Doirion, Supervisor of Unorganized Territories at the Maine Revenue Service, April 26, 2006.

90. For inland acres zoned for development, this analysis applies a parcel-specific value as appraised by the MRS.<sup>67</sup> These appraisal data were provided by LURC.<sup>68</sup>
91. In order to isolate the portion of the total land value associated with its option for future development, this analysis subtracts the per acre value of silvicultural rents from the total value per acre. The per acre value of silvicultural rents was based on MRS tax appraisal data provided by LURC for which land values were estimated for parcels in the northwestern portion of LURC's jurisdiction where silviculture is the only current and likely future land use. The estimated value per acre of strictly silvicultural land is \$300.<sup>69</sup> Subtracting the timber value of the developable acres provides the per acre option value for development.
92. The per-acre value associated with future development is significantly higher in Maine compared to Units 2 and 3. This is explained in part by the characteristics of developable lands in Maine. Specifically, most of the land zoned for development in Maine is lakefront property. Further, the scarcity of acres currently zoned for future development in Maine likely contributes to the high per-acre values.

#### Unit 1 Development Impacts

93. Applying these values to watersheds expected to exceed the LCAS thresholds for habitat conservation, total development impacts in Unit 1 are forecast to be \$2.53 million. Exhibit 4-4 highlights the developable acres for which development is forecast to be precluded due to surpassed habitat conservation thresholds. All impacts are forecast to occur within the private timberlands subunit in Unit 1. Appendix G describes these impacts by watershed.

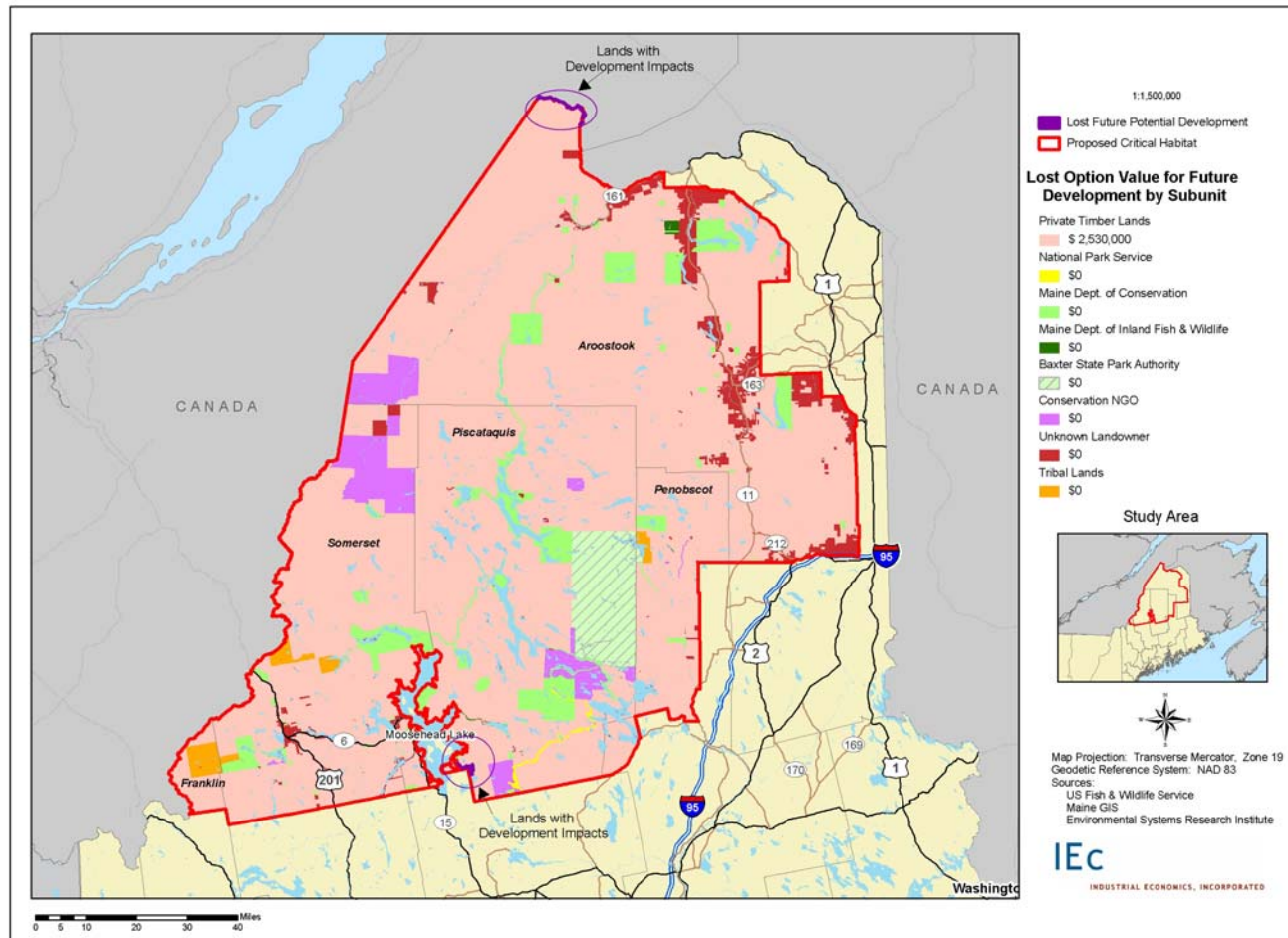
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<sup>67</sup> The LURC parcel boundary data and MRS appraisal data were joined via identical map, plan, and lot numbers. There were instances where the acreages cited in the appraisal data did not reflect the parcel acreage as mapped.

<sup>68</sup> LURC sent IEC a database file containing MRS appraisal data with ID numbers matching those on LURC parcel polygons, received on April 19, 2006 from Ellen Jackson, LURC GIS Coordinator.

<sup>69</sup> MRS appraisal data provided by LURC on April 19, 2006 provided a per acre value of timberland of \$200, and subsequent communication with Bob Doirion, Supervisor of Unorganized Territories at MRS on April 26, 2006 suggested that timberland value likely ranges from \$200 to \$400 per acre. This value range was also corroborated by Tim Glidden, Land for Maine's Future (personal communication on April 27, 2006). This analysis therefore applies the average estimate of \$300 per acre.

EXHIBIT 4-4. DISTRIBUTION OF DEVELOPMENT IMPACTS IN UNIT 1<sup>70</sup>



<sup>70</sup> GIS Source Data: Maine Landownership (Primary Landowners). December, 2005. Old Town, Maine. J.W. Sewall Company. Data received 12/18/2005; LURC Zoning Layer, April, 2006. Augusta, Maine. Maine Department of Conservation, Land Use and Regulatory Commission. Data received 4/19/006; Maine Revenue Services' Appraisal Data. April, 2006. Augusta, Maine. Maine Revenue Services. Data received 4/19/006; Proposed Critical Habitat for Canada Lynx, "mech\_prop" [Shapefile] from U.S. Fish and Wildlife Service, received November 16, 2005.

94. It is important to note that this analysis does not account for potential re-zonings in the future. LURC has permitted re-zonings in the past where it was demonstrated that the proposed development was consistent with the standards in the district and with the Commission's Comprehensive Land Use Plan's (1997) Goals and Policies. That is, if a petitioner is seeking re-zoning of an area for development, (s)he must assure orderly growth and no sprawl. The proposed land use must also demonstrate filling a need in the community and area, and must also have no undue impact on existing uses and resources.<sup>71</sup>
95. For example, Plum Creek Timber Company has proposed a long term development plan in the Moosehead Lake Region of Maine that includes re-zoning for development. This project is located in the study area.

**Plum Creek Proposed Resource Plan at Moosehead Lake in Maine**

96. As noted above, an important caveat to this analysis is that it does not account for possible future re-zoning within the region to accommodate greater levels of development. This region of Maine is relatively rural and large scale re-zoning petitions are rare. However, an outstanding petition for re-zoning from Plum Creek is currently being reviewed by Maine's Land Use Regulatory Commission (LURC) for concentrated residential development in the Moosehead Lake region of Maine.
97. Exhibit 4-5 highlights the current development status of the five watersheds surrounding Moosehead Lake absent any re-zoning.

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<sup>71</sup> Maine Land Use Regulatory Commission, Comprehensive Land Use Plan For Areas Within the Jurisdiction of the Maine Land Use Regulatory Commission, as amended in 1997, accessed at <http://www.maine.gov/doc/lurc/reference/clup.html>.



**EXHIBIT 4-5. EXISTING DEVELOPMENT AND DEVELOPMENT POTENTIAL OF  
WATERSHEDS SURROUNDING MOOSEHEAD LAKE**

WATERSHED	SIZE OF WATERSHED (ACRES)	DEVELOPED ACRES	POTENTIAL FUTURE DEVELOPMENT (ACRES)	PERCENT OF WATERSHED EXPECTED TO BE DEVELOPED*
North Bay	72,982	853	1,379	3.1%
Socatean Stream	23,344	0	0	0.0%
Carry Brook	9,621	0	19	0.2%
Mount Kineo Narrows	10,862	296	177	4.4%
Moosehead Lake at Outlet Stream	6,754	0	0	0.0%
* The percent of the watershed forecast to be developed is the sum of the already developed acres, plus undeveloped acres zoned for development, divided by the total acres in the watershed.				

98. For the five watersheds, current zoning does not approach the 15 percent habitat disturbance threshold. The watershed with the greatest forecast development activity is the "Mount Kineo Narrows" watershed, for which current zoning predicts approximately 4.4 percent development. It therefore follows that absent any re-zoning in the region, full build out of developable acres would not surpass lynx habitat conservation thresholds and therefore no economic losses are forecast.
99. The April 2006 Petition for Rezoning proposed by Plum Creek proposed 4,200 acres of development, including residences, campgrounds and associated recreational facilities, a lodge facility, and nature-based facilities and sport camps.<sup>72</sup> This proposal also incorporated plans for 72,000 acres of permanent conservation lands. The proposed development lands are concentrated around Moosehead Lake. As proposed developments were not mapped by Plum Creek according to LAU proxy watersheds applied in this analysis, it is uncertain whether this level of development may exceed the lynx habitat conservation threshold of 15 percent in any given watershed.
100. Whether this threshold is exceeded further depends on the Service's interpretation of the footprint of a development in the context of habitat conservation. For example, if a five acre parcel is planned for development, but development would only actually occur on one acre of the parcel with the other four acres remaining forested, it is uncertain whether the Service would interpret this as one acre or a five acres toward the habitat disturbance threshold. In the case of the former (considering the five acre parcel a one acre disturbance), counting the full 4,200 acres toward habitat conservation thresholds will overestimate impacts to development.

<sup>72</sup> Plum Creek. April 2006. Concept Plan for Plum Creek's Lands in the Moosehead Lake Region" Petition for Rezoning.

101. To provide context for this level of development however, Exhibit 4-6 describes the amount of development that would need to occur above the existing prediction in each watershed to exceed the 15 percent habitat conservation threshold.

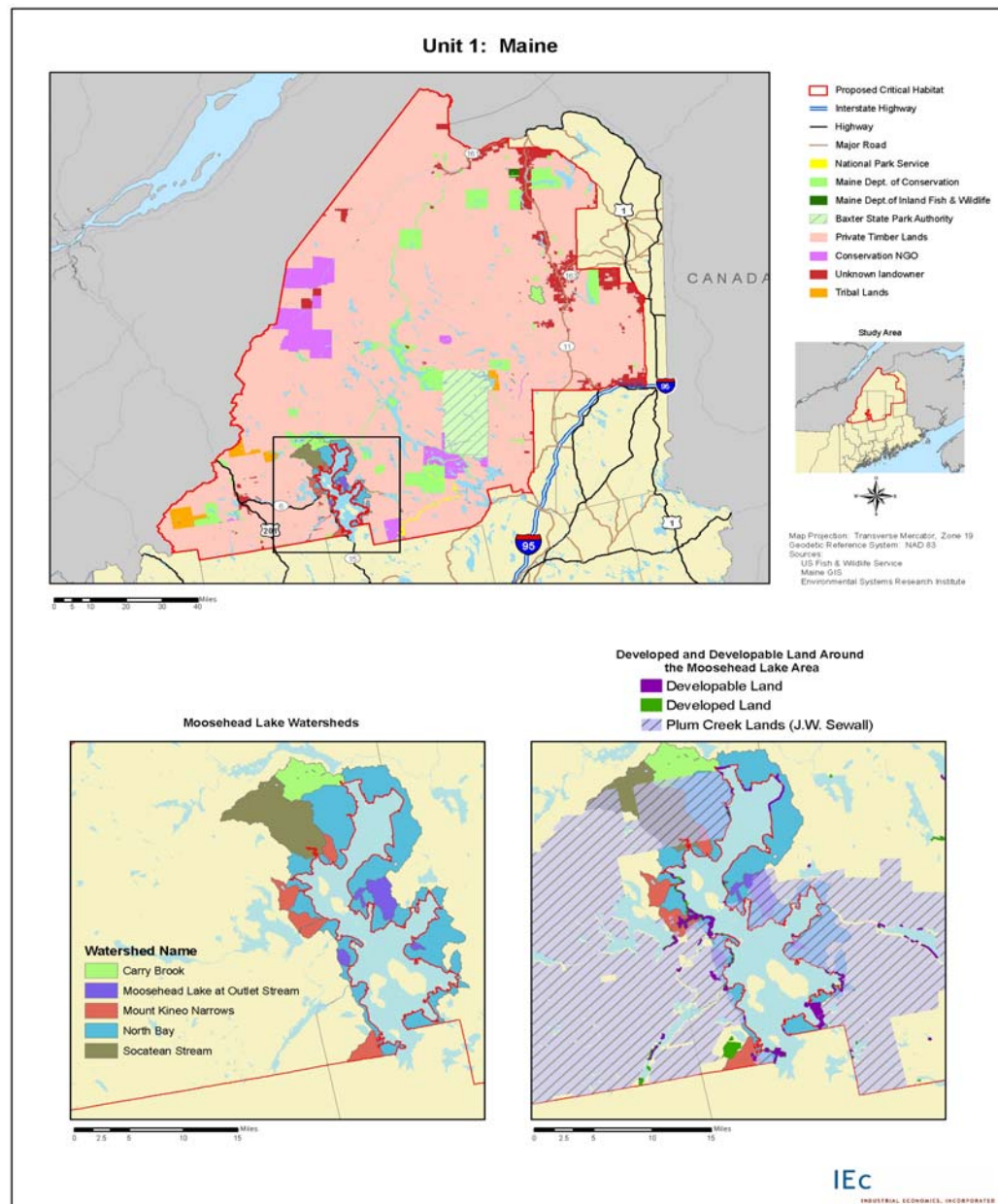
**EXHIBIT 4-6. ESTIMATED MAXIMUM LEVEL OF FUTURE DEVELOPMENT AT MOOSEHEAD FOR WHICH LYNX CONSERVATION WOULD NOT RESULT IN ECONOMIC IMPACTS**

WATERSHED	SIZE OF WATERSHED (ACRES)	PROJECTED BUILDOUT BASED ON EXISTING ZONING (ACRES)	LEVEL OF INCREMENTAL DEVELOPMENT THAT WOULD REACH 15% HABITAT CONSERVATION THRESHOLD (ACRES)
North Bay	72,982	2,232	8,716
Socatean Stream	23,344	0	3,502
Carry Brook	9,621	19	1,424
Mount Kineo Narrows	10,862	473	1,157
Moosehead Lake at Outlet Stream	6,754	0	1,013

102. Expected lost development option values depend on the spatial distribution of Plum Creek's proposal for the development of 4,200 acres within these and surrounding watersheds. For example, if all development is proposed within the "North Bay" watershed (which contains Moosehead Lake) and the full acreage will actually be cleared and developed, the habitat disturbance threshold would not be exceeded.
103. Exhibit 4-7 highlights the location of the Moosehead Lake watersheds within the proposed critical habitat in Unit 1. It also identifies developed and developable (currently undeveloped and zoned for development) parcels, and Plum Creek's land ownership within the region.



EXHIBIT 4-7. MOOSEHEAD LAKE WATERSHEDS AND PLUM CREEK LANDS WITHIN THE PROPOSED CRITICAL HABITAT IN MAINE<sup>73</sup>



<sup>73</sup> GIS Source Data: 12-Digit Hydrological Unit Codes for Maine, "WBDME6\_A" [Shapefile]. (2004). Augusta ME: Maine Office of Geographic Information Systems (MEGIS). Available: <http://megis.maine.gov/catalog/> [September 5, 2006]; Maine Landownership (Primary Landowners). December, 2005. Old Town, Maine. J.W. Sewall Company. Data Received 12/18/2005; LURC Zoning Layer, April, 2006. Augusta, Maine. Maine Department of Conservation, Land Use and Regulatory Commission. Data Received 4/19/006; Maine Revenue Service's Appraisal Data. April, 2006. Augusta, Maine. Maine Revenue Service. Data received 4/19/006; Proposed Critical Habitat for Canada Lynx, "mech\_prop" [Shapefile]. U.S. Fish and Wildlife Service, received November 16, 2005.

#### 4.3.2 UNIT 2: MINNESOTA

##### Identification of Where Development Impacts May Occur

104. For Minnesota, the 12-digit HUC level watershed has not yet been mapped; therefore, this analysis applies the 11-digit HUC watershed boundaries to approximate LAUs. There are approximately 65 watersheds intersecting the study area in Minnesota.<sup>74</sup>
105. Unit 2 of the study area contains the most densely populated watersheds. This analysis does not forecast further development impacts in areas that are already developed. Any development activities in these areas would be redevelopment, and no impacts related to lynx habitat conservation are forecast as the habitat in these areas is already disturbed as described in the proposed rule.<sup>75</sup> In particular, watersheds surrounding Duluth have the highest levels of existing development and two watersheds adjacent to Duluth are not expected to lose any option value for future development.
106. As information is unavailable regarding which parcels are specifically zoned for future development in the study area in Minnesota, this analysis applied a number of assumptions to identify which parcels may be developable. First, this analysis removed from consideration all publicly administered lands, including county, Federal, and State, and Tribal lands.<sup>76</sup> These public lands are primarily managed for timber, wildlife, and recreational uses and are considered in other sections of this analysis accordingly. Uses of Tribal lands are discussed in Section 9. Next, lands which were already developed were removed from consideration; specifically, based on aerial photography, this included a ten mile buffer around Duluth and a one-mile buffer along the coast of Lake Superior, where existing development in Unit 2 is concentrated.<sup>77</sup> Lands zoned for timber management in St. Louis County, according to a countywide zoning layer, were removed as well.<sup>78</sup> The remaining 226,825 acres in the study area are considered developable. Overlaying the watershed boundaries, the analysis found:

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<sup>74</sup> 11-Digit Hydrological Unit Codes for Minnesota, "NRCWS99" [Shapefile], 1999, St. Paul, Minnesota: Minnesota Land Management Information Center (LMIC), accessed at [ftp://ftp.lmic.state.mn.us/pub/data/phys\\_biol/water/nrcws99.exe](ftp://ftp.lmic.state.mn.us/pub/data/phys_biol/water/nrcws99.exe) on December 20, 2005.

<sup>75</sup> The November 9, 2005 Proposed Rule describes that waterbodies and "developed areas such as towns, or human-made structures such as buildings, airports, paved and gravel roadbeds, active railroad beds, and other structures that lack the PCEs for the lynx" are excluded from critical habitat.

<sup>76</sup> The following GIS layers were used to represent all publicly owned and administered lands: GAP- County Lands; GAP- Miscellaneous State Lands; GAP- Federal Lands; GAP- Tribal Lands; All " State Land Ownership" files. The files were obtained from MN DNR's Data Deli GIS data clearinghouse, accessed at <http://deli.dnr.state.mn.us/> on April 13, 2006.

<sup>77</sup> The 10-mile buffer around Duluth is consistent with review of housing unit density based on 2000 U.S. Census Block Group data. U.S. Census Bureau, American Factfinder. Decennial Census (2000). Datasets accessed at: [http://factfinder.census.gov/servlet/DownloadDatasetServlet?\\_lang=en](http://factfinder.census.gov/servlet/DownloadDatasetServlet?_lang=en).

<sup>78</sup> No GIS data were available for lands managed for timber for Cook, Lake, and Koochiching Counties.

- For 11 watersheds, existing development exceeds the 15 percent threshold and all future development is assumed to be foregone (for three of these watersheds, however, no future development is anticipated so no losses are quantified).
- For 20 watersheds, existing plus forecast development exceeds the threshold and the incremental development forecast above this threshold is assumed to be lost.
- The remaining 31 watersheds are either not expected to experience future development, or the forecast development activity does not exceed the 15 percent habitat conservation threshold.

#### Determining Development Value

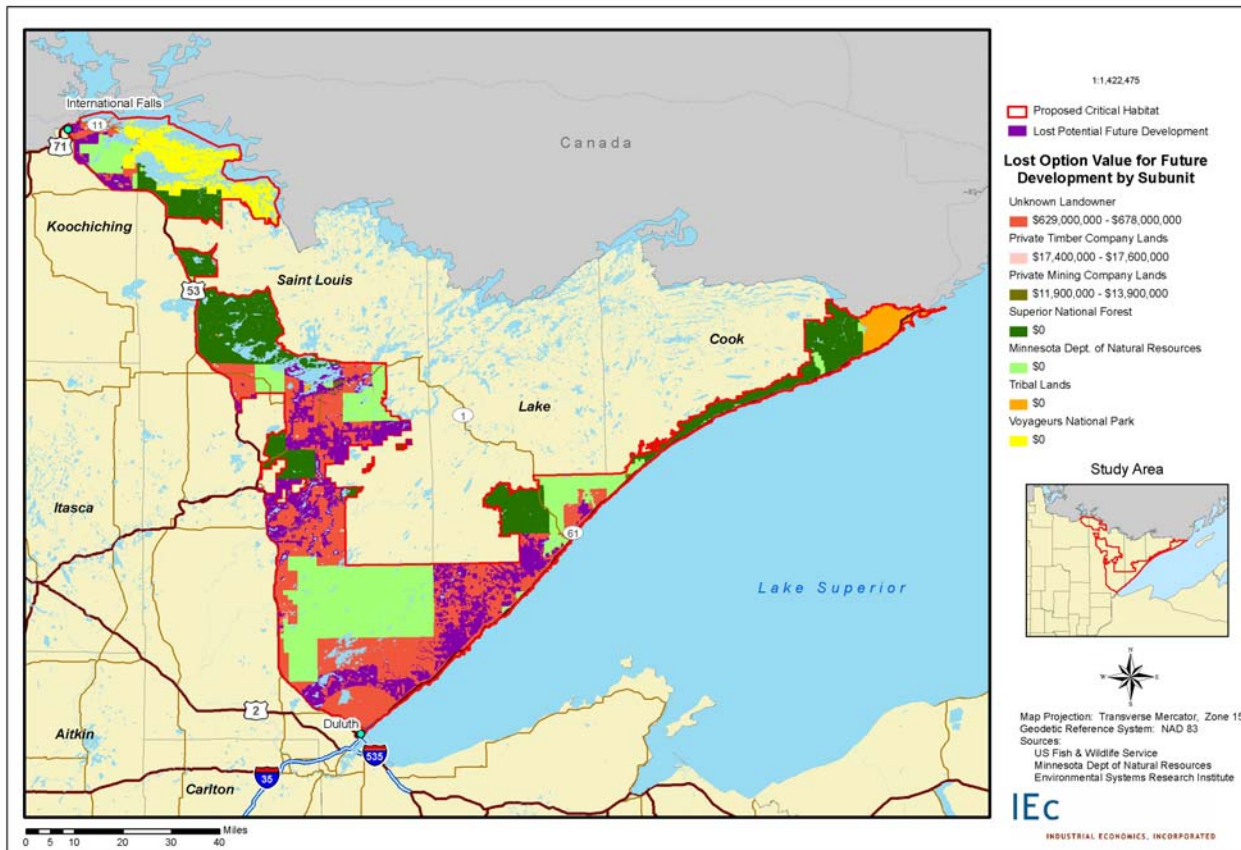
107. To calculate the lost option value for development for Minnesota, per-acre land values were derived from the St. Louis County's Parent Land Sales Database.<sup>79</sup> The database contains all transactions for empty lots from years 2003-2006 and includes information on sale price, lot acreage, sale date, type of land transferred (i.e. residential, commercial, farmland, timberlands, etc.), lake frontage details, and section, range, and township information. These data were filtered for townships that fall within the boundaries of proposed critical habitat and categorized as "private inland" or "private waterfront". Per-acre values for each category were estimated using a weighted average of the values of the total acreage transacted from 2003 to present.
108. As with Maine, all lands within 250 feet of a major water body were considered "waterfront". Average values for the three land types were estimated as follows:
  - Private Inland - \$2,800 per acre
  - Private Waterfront - \$12,600 per acre
109. Where developed lands already exceed the 15 percent watershed threshold, the total value of all future developable acres was assumed to be lost. However, for watersheds where existing plus forecast development exceeds the 15 percent threshold, the incremental development forecast to occur above the 15 percent threshold is assumed to be lost and a range for lost option value within the watershed is calculated. The low-end estimate assumes the lowest-value acres are developed first (e.g., all acres valued at \$2,800 are developed before any one acre valued at \$12,600). In contrast, the high-end estimate assumes that the highest-value acres are developed first.

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<sup>79</sup> St. Louis County Parent Land Sales Database. Received from John Gellatly, Principal Appraiser, St. Louis County Assessor's Office, April 26, 2006. For the "timber", "private", and "private waterfront" classifications, 303, 232, and 1043 data points respectively were used to generate the average per acre value.

Unit 2 Development Impacts

110. Total development impacts in Unit 2 are forecast to be \$658 million to \$709 million and are associated with 28 watersheds. Approximately 80 percent of the total estimated lost development value in Minnesota is associated with 10 watersheds. Impacts are illustrated by subunit in Exhibit 4-8 and detailed by watershed in Appendix G.

EXHIBIT 4-8. DISTRIBUTION OF DEVELOPMENT IMPACTS IN UNIT 2<sup>80</sup>

<sup>80</sup> GIS Source Data: State Land Ownership - County Land Administration, "adm\_ctyIndpy3" (2004), GAP Stewardship - County Lands, "own\_countyp2" (1998), GAP Stewardship - Miscellaneous State Lands, "own\_msstap2" (1998), State Forest Boundaries, "bdry\_stforpy3" (2005), State Park Statutory Boundaries, "bdry\_stprkpy3" (2002), State Land Ownership - Fisheries Land Administration, "adm\_fshIndpy3" (2003), State Land Ownership - Ecological Services Land Administration, "adm\_ecolIndpy3" (1999), State Land Ownership - Small Holdings Land Administration, "adm\_genIndpy3" (1999), State Land Ownership - Parks and Recreation Land Administration, "adm\_prkIndpy3" (1999), Voyageurs National Park [Shapefile]. (2003), St. Paul, Minnesota: Minnesota Department of Natural Resources (MN DNR) Available at: <http://deli.dnr.state.mn.us/> [January 3, 2006]. Proposed Critical Habitat for Canada Lynx, "mnch\_prop" [Shapefile] from U.S. Fish and Wildlife Service, received November 16, 2005. Landownership Subunits, "mnch\_owner" [Shapefile] from U.S. Fish and Wildlife Service, received November 16, 2005.

#### 4.3.3 UNIT 3: NORTHERN ROCKY MOUNTAINS

##### Identification of Where Development Impacts May Occur

111. For Montana, 12-digit HUCs were used as a proxy for LAU boundaries for the purposes of this analysis.<sup>81</sup> At this level, 324 watersheds intersect the study area in Montana.
112. To identify "developable" acres for the Northern Rockies Unit, this analysis applied data from the Montana Cadastral Database, a GIS parcel layer published by the Montana Department of Administration, Information Technology Services Division. The data describe land ownership for taxable parcels (fee land) and public land (exempt property) for the entire state of Montana.<sup>82</sup>
113. To isolate undeveloped lands in the study area, all parcels clearly defined as public lands were removed from the dataset. Private inholdings within public lands, however, were not removed from the dataset and are included in the development analysis. The database was then filtered for "vacant" parcels to isolate undeveloped land. Where ownership and appraisal data were missing (primarily for some lands within Glacier National Park), the related parcels were omitted from the analysis. The remaining parcels were then divided into lands managed for timber and those that were privately-owned and not actively managed for timber.
114. Parcels were considered to have some silvicultural value where nonzero values were identified for "timber acreage type".<sup>83</sup> Where the total parcel acres exceeded the acres designated for timber management within a parcel, the remaining acres were considered developable.
115. A total of 125,420 acres are characterized as developable in Unit 3. Of the 324 watersheds intersecting Unit 3, existing development exceeds the 15 percent threshold in 71 and all future development is assumed to be foregone. For 47 watersheds, existing plus forecast development exceeds the threshold and the incremental development forecast above this threshold is assumed to be foregone. The remaining 206 watersheds are either not expected to experience future development, or the forecast development activity does not exceed the 15 percent habitat conservation threshold.

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<sup>81</sup> Draft 6th Code Hydrologic Units [Shapefile], 2006, Bozeman, Montana: Natural Resources Conservation Service, accessed at <http://nris.state.mt.us/nsdi/watershed/datapage.html> on September 4, 2006.

<sup>82</sup> Montana Natural Resource Information System (NRIS), GIS Datalab accessed, April 18, 2006 at <http://nris.mt.gov/gis/gisdata/lib/gisDataList.aspx>.

<sup>83</sup> The property type attribute "agricultural rural" or "agricultural urban" describes agricultural/timber land located in incorporated and unincorporated areas of the county. The acreage type classification of "timber" denotes forest lands exceeding 15 contiguous acres that is capable of producing timber that can be harvested in commercial quantity. (<http://gis.mt.gov/InfoHtm/ValueInfo.htm>)

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#### Determining Development Value

116. Similar to the Minnesota analysis, parcels for which the only identified use is timber management were not defined as "developable" and are considered in terms of lynx conservation in Section 3 of this analysis.<sup>84</sup> The per-acre option value of development for the remaining "developable" lands was calculated by subtracting the per-acre timber value from the total appraised value per acre.<sup>85</sup>
117. Over 80 percent of the identified developable parcels in Unit 3 fall within Powell County, Montana. Powell County zoning regulations were changed in 1996 to define allowable lot sizes (in some areas at 160 acres) to discourage second home development and avert rural sprawl.<sup>86,87</sup> These existing development constraints may explain why the per-acre value for developable lands in Unit 3 is significantly smaller than Unit 1 or Unit 2.
118. The majority of the study area in Montana is currently actively managed for timber. For these areas, appraised values do not reflect an option value for development as this was not considered a primary future use of these parcels by appraisers absent indication that specific parcels may switch primary land use and be re-zoned for mixed use or development in the future.<sup>88</sup> The value of a parcel reflects all of its potential future uses. In the case that available information suggests that the ongoing land use (in this case, silviculture) is likely to be the reasonably foreseeable future land use, the option value of development of a parcel may be small or negligible. In the case that landowners believe sufficient development pressure exists in the region to convert land parcels from timber management to residential or commercial development, this analysis may underestimate impacts to future development projects and overestimate impacts to timber management activities.

#### Unit 3 Development Impacts

119. Total development impacts in Unit 3 are forecast to be \$45.7 million to \$57.6 million. Of the 118 watersheds expected to experience impacts, approximately 80 percent of the total estimated lost development value in Montana is associated with 26 watersheds. The distribution of impacts is illustrated in Exhibit 4-9 by subunit and detailed by watershed in Appendix G.

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<sup>84</sup> Lands managed for timber had nonzero values identified in the "timber acreage type" attribute field.

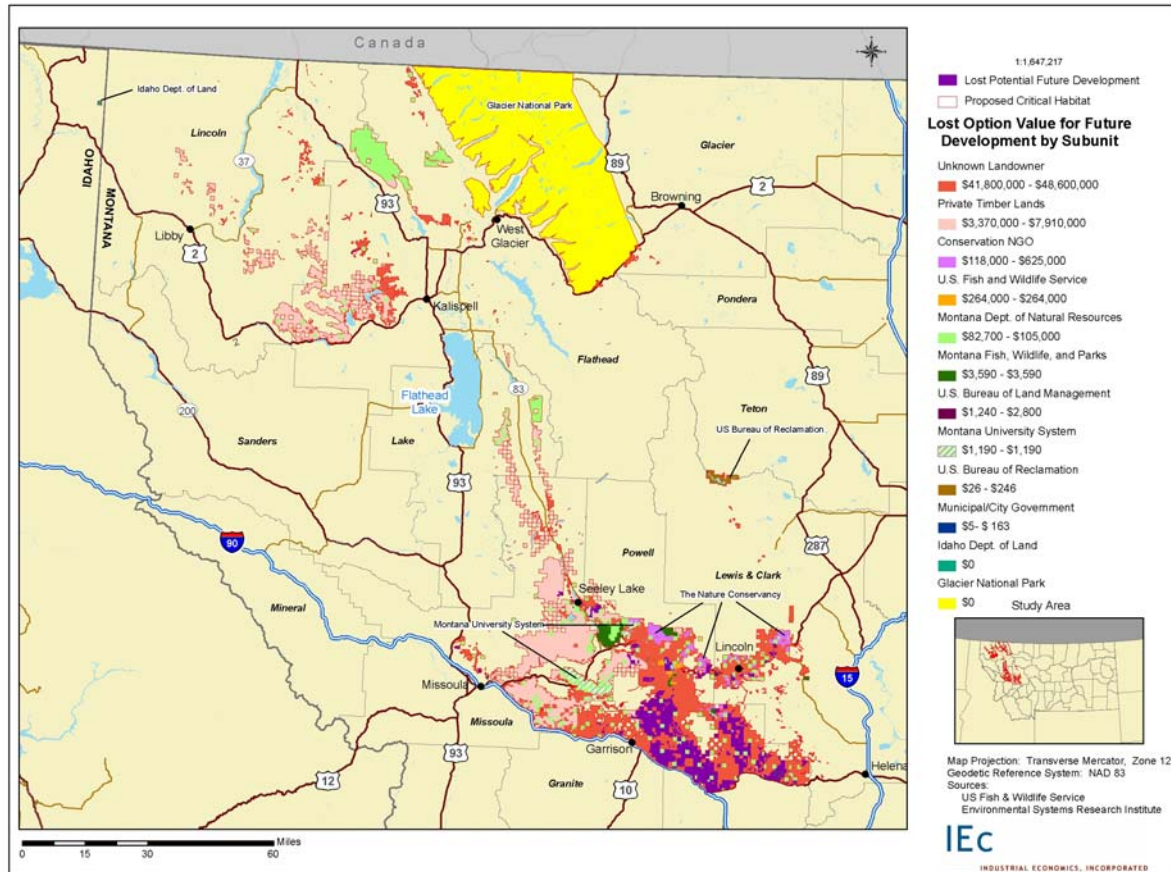
<sup>85</sup> Per-acre timber values were generated by isolating all parcels where the total parcel acreage equaled the assigned acres managed for timber.<sup>85</sup> Based on nearly 800 parcels within the boundaries of potential critical habitat, the per-acre value for lands managed for timber was \$619.

<sup>86</sup> Powell County, Powell County Development Regulations, as amended in November 2000, accessed at <http://www.mtsmartgrowth.org/CS&Rpub/Ordinances/Powell%20County%20Development%20Regulations.pdf>, May 1, 2006.

<sup>87</sup> Montana Smart Growth Coalition, Powell County Development Regulations, accessed at <http://www.mtsmartgrowth.org/CS&Rpub/CS/Powell.doc>, May 1, 2006.

<sup>88</sup> Missoula County Appraisers Office, personal communication, September 27, 2006. Land zoned for timber management is appraised on the grade and productivity of the timber stand.

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EXHIBIT 4-9. DISTRIBUTION OF DEVELOPMENT IMPACTS IN UNIT 3<sup>89</sup>

<sup>89</sup> GIS Source Data: Draft 6th Code Hydrologic Units [Shapefile]. (2006). Bozeman, Montana: Natural Resources Conservation Service. Available: <http://nris.state.mt.us/nsdi/watershed/datapage.html> [September 4, 2006]; Montana Cadastral Database [Shapefile]. (1999; on-going updates). Helena, Montana: Dept. of Administration/Information Services Division; with MT Dept. of Revenue and some MT. Counties. Available at: <http://gis.mt.gov/> [April 16, 2006]; Proposed Critical Habitat for Canada Lynx, "nrch\_prop" [Shapefile] from U.S. Fish and Wildlife Service, received November 16, 2005; Landownership Subunits, nrch\_owner" [Shapefile] from U.S. Fish and Wildlife Service, received November 16, 2005.